

Challenges of Learning and Teaching Technical Vocabulary

Mirela Elena Costeleanu¹

National University of Science and Technology

POLITEHNICA Bucharest

University Centre Pitești

Abstract:

Vocabulary acquisition is commonly seen as the cornerstone of language learning, having a huge impact on reading comprehension, verbal communication and writing proficiency. In English for Specific Purposes classes, it is essential for students to build a body of terms that are frequently used in their area of study. The usage of English in technical documentation, professional interactions and research speaks volumes about its indispensability in today's workplace. For technology professionals, English opens the doors to opportunities that would otherwise be out of reach. Acquisition of technical vocabulary in ESP classes may be problematic for both teachers and students.

Keywords: challenges, vocabulary, technical, communication, professional

1. Introduction

The importance of English proficiency cannot be overstated. Companies all over the world constantly look for individuals who are able to bridge cultural gaps and speak about complex issues and processes. A common language allows multinational enterprises to standardize their operations across borders and to streamline their processes, which leads to improved efficiency and higher performance. Most training programs are conducted in English, offering employees a genuine support in their language learning process.

Nowadays, engineers all over the world are working within global environments. An engineering professional may be an expert in their field, but they will lag behind their peers if they have difficulty in speaking English. Proficiency in the English language is of the utmost importance to engineering professionals for various reasons. Firstly, they need to be able to communicate clearly and effectively with their co-workers, clients and

¹ mirelacosteleanu@yahoo.com. ORCID ID: 0009-8515-7632

stakeholders. Secondly, documentation is indispensable in their activity, access to manuals, reports and presentations making their work easier and more productive. Since scientific research is mostly done in English, solid knowledge of English will allow engineers to read, write and understand technical publications and research papers. Last but not least, English proficiency can be described as a gateway to numerous career advancement opportunities. Employees with a high level of English fluency are more likely to engage in networking and team collaboration than those who lack the ability to write and converse effectively.

Since English has become the most common language spoken in the world of technology, many college programs expect their students to be proficient in English. Every academic discipline has a specialized vocabulary that is used specifically in that field as well as common words that may have different meanings depending on the context they are used in. In addition to general academic vocabulary, ESP students need to understand and memorize subject-specific or technical vocabulary.

2. Literature review

According to Wilkins, “without grammar very little can be conveyed, without vocabulary nothing at all can be conveyed” (1972: 111). When we speak, we want to communicate meanings and meanings are expressed above all through vocabulary (Grauberg 1997). Vocabulary is central to learning content and vocabulary learning is more satisfying than any other aspect of language learning. Learners often associate progress in their learning process with vocabulary development because it is the only quantifiable aspect of language learning.

When discussing vocabulary, a distinction is made between receptive and productive vocabulary. According to Hedge (2014), receptive vocabulary refers to a learner’s ability to recall and recognize various aspects of word knowledge whereas productive vocabulary refers to his/her ability to use the word automatically in his/her own sentences.

Nation (2013) defines vocabulary breadth as the number of words learners are familiar with. Meara (2009) describes vocabulary depth as knowledge of how various aspects of word knowledge interact with each other. Acquiring the former is considered to be easier than acquiring the

latter. Knowing a word involves more than being familiar with its individual meanings. Nation (2013) shows that learners need to master a list of aspects in order to be able to use a word effectively and productively in context. Language learners need to know the meaning(s) of the word, its spelling, its pronunciation as well as what patterns it usually occurs in.

The term *technical vocabulary* refers to single- or multi-word items which carry a well-defined discipline-specific denotative meaning within the framework of a given discipline, thus avoiding ambiguity in the field (Nation and Coxhead 2012, Nation 2013). It is also referred to as *discipline-specific vocabulary*, *specialized lexis/vocabulary*, *terminological words and terms* (Liu and Lei 2019).

It is essential to make a distinction between two categories of vocabulary: semi-technical and technical vocabulary since they are very important to learners studying ESP. Dudley-Evans and St John (1998) suggest resolving overlapping categories into two broad groupings: vocabulary that is used in general language but has a higher frequency of occurrence in specific and technical descriptions and discussions vs. vocabulary that has specialized and restricted meanings in certain disciplines and which may vary in meaning across disciplines. The first group should be referred to as semi-technical vocabulary and the second area should be regarded as technical vocabulary.

3. Challenges of learning and teaching technical vocabulary

Research shows that vocabulary development benefits learners' reading, writing and listening skills, which are essential for academic success (Laufer and Ravenhorst-Kalovski 2010; Willis and Ohashi 2012).

One of the reasons why technical English is challenging is its vocabulary. In ESP classes, students study various discipline-related texts, which can be either authentic or simplified by their teachers in order to make them more accessible. In either case, they contain technical words whose understanding is essential to the overall comprehension of the material. The vocabulary an electronics engineer is expected to know is different from the one needed by a mechanical engineer. Moreover, a further distinction can be made between automotive engineers and logistics engineers, for instance. They both study Mechanical Engineering, but their

main specialized disciplines focus on different processes and procedures, which is why the specialized terminology they will need in the workplace differs from one case to the other.

ESP students are expected to learn a large number of technical words in a relatively short period of time, which turns the process of developing their technical vocabulary into a very complex one. Just recognizing a word in context does not ensure its retention or the fact that it will become part of the learners' productive ability. What learners need to do is to become actively involved with the meaning of the new word in order to retain it and to learn how to use it in new contexts.

English technical vocabulary is difficult to learn for various reasons.

3.1. Vastness of vocabulary

The first question that arises when discussing technical vocabulary learning and teaching refers to how much technical vocabulary engineering students need to know in order to understand materials in the classroom. It is commonly assumed that, if students understand 80-85% of the words of a text, they are likely to guess the rest and understand the text as a whole (Penny 2012). According to Schmit (2008), students need to be able to understand between 90% and 95% of the words of a text in order to be able to understand it.

Each engineering discipline has its own specialized vocabulary. Professionals need to understand it in order to be able to communicate effectively in the workplace. The amount of technical vocabulary they need to know depends on a number of factors. All engineers, irrespective of their specialization, should be familiar with fundamental technical terms. It would be awkward for a design engineer, for instance, not to know words like *matrix*, *momentum*, *joule* or *watt*, even if he/she does not use them in his/her profession. They also need to be familiar with a variety of terms that are essential to their field. The amount of technical vocabulary needed by an engineer is also closely connected with their career level and experience. Thus, senior engineers are expected to have a larger technical vocabulary than junior engineers since the former need to be able to perform more complex tasks than the latter.

An engineering student needs to know hundreds or even thousands of specialized words. In ESP classes, it is the teachers' responsibility to decide which words to teach, how much vocabulary to teach and how to teach it. They should prioritize essential vocabulary and start with the most accessible words and, once students have internalized these words, introduce the most complex ones gradually. Deciding which words are worth memorizing is one of the biggest challenges teachers and learners are faced with when it comes to vocabulary acquisition.

Teachers should guide students towards becoming effective and efficient learners of technical vocabulary. During self-directed study, learners should focus on terms which are very commonly used in their field of study. More frequent words have greater value than less frequent words, because they are more likely to be needed for communication. For instance, when studying types of heat treatment, terms like *quenching*, *annealing*, *tempering*, *case hardening* and *age hardening* are essential to know. The problem with these terms is that it may be difficult to find their Romanian correspondents even with the help of technical dictionaries. Thus, *quenching* is translated as *călire*, *annealing* is translated as *temperare*, *(re)coacere*, *decălire* whereas *tempering* is translated as *temperare*, *călire*, *detensionare*. It is the definition of each process, its purpose and its common applications that will help learners distinguish among the three terms.

Learners should also prioritize words that directly relate to problem-solving or real-world applications. In this way, they can better understand how theory translates into practice. Words like *stress*, *strain*, *fatigue*, *tolerance*, *hardness*, and *strength* are very useful in technical discussions and also in industry settings where engineers are expected to apply their knowledge to solve practical problems.

3.2. Complexity of technical terms

English technical vocabulary contains words that are difficult to pronounce, spell or remember. They describe highly specific concepts or processes in various fields and they often have Latin or Greek roots. In Mechanical Engineering, for instance, learners often encounter words like *radius*, *momentum*, *torque* and *modus*, which are derived from Latin and words like *dynamics*, *kinetikos* and *chronos*, which are derived from Greek.

When studying issues like heat transfer and changes of temperature and states, students encounter words like *endothermic* and *exothermic*, which they find difficult to pronounce, understand and memorize. A good idea is to break such words into their constituent parts (endo = inside, exo = outside, thermic = related to heat) or to use diagrams that show heat transfer. They can also practise with mnemonics in order to distinguish them (*exo* sounds like *exit* whereas *endo* sounds like *enter*).

Many English technical words are very similar to their Romanian correspondents, which makes it easier for Romanian learners to understand and use them correctly. Words like *metal*, *oxygen*, *carbon*, *oxide*, *corrosion* and *alloy* pose no problems to learners as they are nearly identical to their Romanian equivalents. However, learners need to pay attention to their pronunciation and to the differences in spelling between the English words and the Romanian variants. Yet, there are situations when these similarities may be misleading. One example of confusing words is *silicone*, which Mechanical Engineering students often translate as *silicon* instead of *siliciu*. Similarly, many Romanian engineering students mistakenly translate the phrase *thermal properties* as *proprietăți termale* instead of *proprietăți termice*. The Romanian adjective *termic* is used in scientific and engineering contexts in reference to heat whereas the adjective *termal* refers to springs and geothermal energy.

3.3. Context-specific meanings

Many technical words have specialized meanings that differ from their general English usage. For instance, when used in general English, *force* means *strength* or *power*. When used in technical contexts, it refers to *a physical influence that changes an object's motion*. *Load* in general English refers to *a heavy weight* whereas in technical English it refers to *the demand placed on an object*. *Stress*, when used in general English, refers to a state of *emotional or mental strain or tension*. Its technical meaning is *the internal resistance of a material to an applied force, measured in force per unit of area (Pascals)*.

Words like *die*, *creep*, *wear* and *yield* may also cause confusion among learners of technical vocabulary. Students are familiar with their meanings as verbs which are frequently used in general English. In

Mechanical Engineering texts, they are used as nouns with totally different meanings from the ones they have in general English contexts: *stop living* vs. *a shaped piece or mould made of metal or other material used to shape or put a pattern on metal or plastic*; *move slowly or quietly* vs. *the slow, permanent deformation of a material under constant stress over time, often at high temperature*; *to have clothing on* vs. *the gradual loss of material from surfaces due to friction, abrasion, or corrosion*; *give way or surrender* vs. *the point at which a material begins to deform permanently under stress*.

A lot of technical words have different meanings in different fields of mechanical engineering. For instance, *torque*, when used in automotive engineering, refers to *the rotational force generated by an engine, affecting vehicle acceleration* whereas in machine design, it refers to *the twisting force applied to shafts and gears*. *Power* may refer to *the rate of doing work, measured in watts or horsepower* (thermodynamics), *the engine's ability to perform work, affecting vehicle speed and performance* (automotive engineering) and *pneumatic or hydraulic power used in systems like pumps and compressors* (fluid mechanics).

3.4. Abstractness of concepts

Many technical terms refer to abstract concepts that are hard or impossible to visualize, which is why students find them difficult to learn. Such words as *bolt*, *hammer* and *engine* are more easily internalized by students than *momentum*, *flow*, or *elasticity*. The former refer to concrete objects whereas the latter describe forces, properties or performance measures that require deeper understanding of the mechanical field of study.

3.5. Limited practical usage

Technical English is highly valuable in academic and work environments. Yet, students have few opportunities to use the newly acquired vocabulary in everyday situations, which is why they may know what they mean in theory, but they find it hard to use them in practical situations. Using *adhesive* instead of *glue*, or *having high tensile strength* instead of *being strong* may sound out of place when speaking to non-engineering peers, but it may help reinforce their understanding by making the vocabulary more relevant and more familiar to them. The more often

learners use technical words in everyday life, the more confident and comfortable they will feel when using them in the classroom and in the workplace.

3.6. Rapidly-evolving fields

The engineering field is constantly evolving. New technologies and concepts are emerging at a very fast pace. As a consequence, new technical words are introduced to describe developments and innovations, which makes it difficult for engineering students and engineers to keep up to date. *Additive manufacturing*, *advanced manufacturing* and *autonomous vehicles* are some examples of new engineering terms that have gained prominence due to recent advancements in technology.

4. Strategies for teaching technical vocabulary

Some EFL teachers may consider that it is not their responsibility to teach technical vocabulary. This may also be the case of ESP teachers who lack the technical expertise in the subject matter they are teaching. Dudley-Evans and St John (1998) are of the opinion that ESP teachers should not teach technical vocabulary; they should only check if the students understood technical vocabulary that appears as carrier content for an exercise

Teaching technical vocabulary effectively requires techniques that help learners not only understand the meaning of the new words, but also memorize them and use them productively in real-world contexts.

1. Translation

Translation can be a useful tool in teaching technical vocabulary as it can help learners grasp new words faster and unequivocally. While the definition of a technical term may be misleading, translation generally provides an immediate and clear explanation, leaving no room for interpretation. Besides, it saves time and effort, being appropriate especially with beginners. It encourages autonomous learning, reducing students' reliance on their teachers. Yet, translation may turn out to hinder learning if it is not used appropriately. If overused, it may have a negative impact on the process of learning/teaching technical vocabulary. When using

translation, learners focus on finding an equivalent word in Romanian instead of trying to understand the concept behind the technical word. Just telling Mechanical Engineering students that *metal fatigue* means *oboseala la metale* won't help them understand what it actually refers to, that is *structural weakening due to repeated stress*.

2. Contextual learning

Technical terms should be introduced within real-world contexts which allow students to see how the new words are used in practice.

3. Visual aids and diagrams

Teachers can use diagrams and charts that represent the technical concepts associated with the new technical words. Visual learning can support comprehension and retention. For instance, teachers can use a Venn diagram to show students how terms like *stress* and *strain* overlap when it comes to deformation, but differ as far as measurement is concerned.

4. Active learning activities

Teachers can use role-playing and simulations which offer learners opportunities to use the new vocabulary in realistic settings. Such activities bridge the gap between theoretical knowledge and practical application, making abstract terms easier to understand and memorize. Software like MATLAB can simulate physical systems. Students can change variables like force, torque and velocity and see how they affect the behaviour of the system in real time.

5. Mnemonics and memory aids

Complex technical terms can be remembered easily if teachers use mnemonics or acronyms. Project management, for instance, is divided into four stages: initiating, planning, monitoring and closing. To help students memorize them, teachers can use the acronym IPMC.

6. Group discussions

Having students work in pairs and small groups encourages them to practise their technical vocabulary and develop their communication skills.

7. Repetition

Students who are constantly exposed to technical vocabulary are likely to understand, to integrate the new words into their active vocabulary and to use them spontaneously in both academic and real-world contexts. If

students encounter the new terms in multiple forms (in reading materials, discussions and simulations), retention will be more effective.

8. Use of technology and interactive tools

There are various online resources and interactive tools that can help students engage with technical vocabulary and practise it regularly.

Case Study

A questionnaire was given to engineering students in order to identify the main challenges encountered by them in the process of learning technical vocabulary and developing their communication skills. It contained a set of 5 questions aimed at establishing levels of student willingness to invest time and effort in developing their technical vocabulary, levels of student awareness of the importance of being able to use it effortlessly and productively in the classroom as well as in the workplace, and levels of student autonomy in learning it and using it in the classroom. Students were also asked to rank the main challenges they were faced with in the process of learning technical vocabulary in the order of importance.

The research participants were 50 Mechanical Engineering students. 41 students were in the 19-23 age group, 8 students were in their thirties and one of them was in his fifties. 38 were male, 12 were female.

The results of the survey showed that 38 students described themselves as being willing to make efforts in the classroom to boost their technical vocabulary and to learn how to use it in real-world situations. The other 12 students responded they were unwilling to develop their technical vocabulary as they were focused on their specialized disciplines. The participants were also asked about levels of willingness to study outside the classroom. Only 14 of them responded that they were willing to study on their own to consolidate the knowledge acquired in the classroom and to learn new words. The others responded that they prioritized their specialized courses.

The survey also revealed that 44 students were aware of the importance of having good communication skills in the classroom and in their future professions. These students were conscious of the fact that having a good understanding of English technical vocabulary is a

requirement in their current course and in the long run. The other 6 students considered that having strong technical knowledge in their field of study is much more important for their career success than having good language skills.

When asked about their level of autonomy in learning, understanding and using the technical vocabulary in the classroom and outside the classroom, 12 students responded that they had enough vocabulary to be able to understand a technical text and solve exercises effectively without the teacher's intervention. 9 students responded that they needed guidance from their teacher about half of the time while the other 29 students said they almost always relied on their teacher's help.

Among the challenges encountered in the process of increasing their technical vocabulary and learning how to use it in real-world situations, the students mentioned their low level of general English (22), the insufficient time allocated to the study of technical English - 2 semesters, 2 hours a week (8), the complexity of the technical language (9), limited exposure and practice outside the classroom (8), the use of inadequate materials in the classroom (3).

They were asked to explain why they found it hard to acquire and memorize technical vocabulary. These are some of their answers:

S1: "I find English technical words very difficult to memorize because they are long and difficult to pronounce."

S2: "I think the technical vocabulary is impossible to master because it is very large. New words never cease to occur in technical texts no matter how much you study."

S3: "Technical topics are sometimes very complex and difficult to understand. When you study them in English, the effort is twice as big as it is when studying them in Romanian."

S4: "Sometimes understanding the technical texts we discuss in the classroom requires technical knowledge we do not have."

As far as age differences are concerned, the study revealed that younger students reported more difficulties encountered in learning technical vocabulary than older students.

As to gender, some slight differences were noticed between males and females in their willingness to work outside the classroom in order to

develop their technical vocabulary. Thus, of the 14 students willing to do extra work at home, 10 were female.

Conclusion

The importance of vocabulary learning for foreign language acquisition cannot be overestimated. A robust vocabulary improves all areas of communication – listening, speaking, writing and reading. A limited vocabulary, on the other hand, impedes successful communication in the classroom and, later, in the workplace. Learning English technical vocabulary poses a lot of difficulties to Romanian engineering students, its open-endedness and lack of rules being seen as the main sources of problems. ESP teachers are also faced with a lot of challenges when teaching technical vocabulary, the decision as to which words to teach, how many words to teach and how to teach them being the most problematic one.

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